LA-UR-02-6141

The LANL ADVANCED ACCELERATOR APPLICATIONS PROJECT

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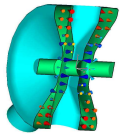
LANL

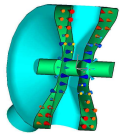
Workshop on the Advanced Design of Spoke Resonators

Los Alamos, NM, USA
October 7 and 8, 2002



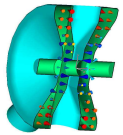
AAA PROGRAM

- **Authorized by Congress to begin in fiscal year 2001, the DOE Advanced Accelerator Applications (AAA) program was created to address pressing nuclear issues facing the United States:**
  - nuclear energy and waste management concerns
  - declining US nuclear infrastructure
  - global nuclear leadership
- **website: http://aaa.lanl.gov/**



AAA PROGRAM

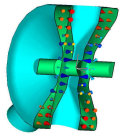
- **DIRECTION & FUNDING PRESENTLY UNCLEAR**
- **ADVANCED ACCELERATOR APPLICATIONS PROGRAM MAY BECOME "ADVANCED FUEL CYCLES PROGRAM"**
- **OR, THERE MAY BE TWO SEPARATE PROGRAMS**
- **DECISION WILL BE LATER IN FY2003**
- **PROPOSAL IN US CONGRESS FOR ACCELERATOR DRIVE TEST FACILITY**



ACCELERATOR TRANSMUTATION OF WASTE

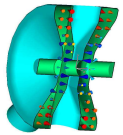
WHY SPOKE CAVITIES?

- TECHNICAL SUPERIORITY TO DTL & CCDTL
- INDUSTRIAL FABRICATION PROVEN
- COMPARABLE INSTALLED COST
- LOWER OPERATING COST
- HIGHER RELIABILITY



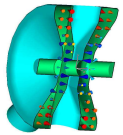
AAA PROGRAM FY2003 PRELIMNARY PLAN

- CEA/CNRS/DOE COLLABORATION
- DESIGN/BID POWER COUPLER
- DESIGN/SPECIFY ELECTROPOLISHING FACILITY
- ATW STUDY
- NIOBIUM STUDY w/JLAB & UVA
- INFORMAL COLLABORATION WITH ANL
- INFORMAL COLLABORATION WITH INFN

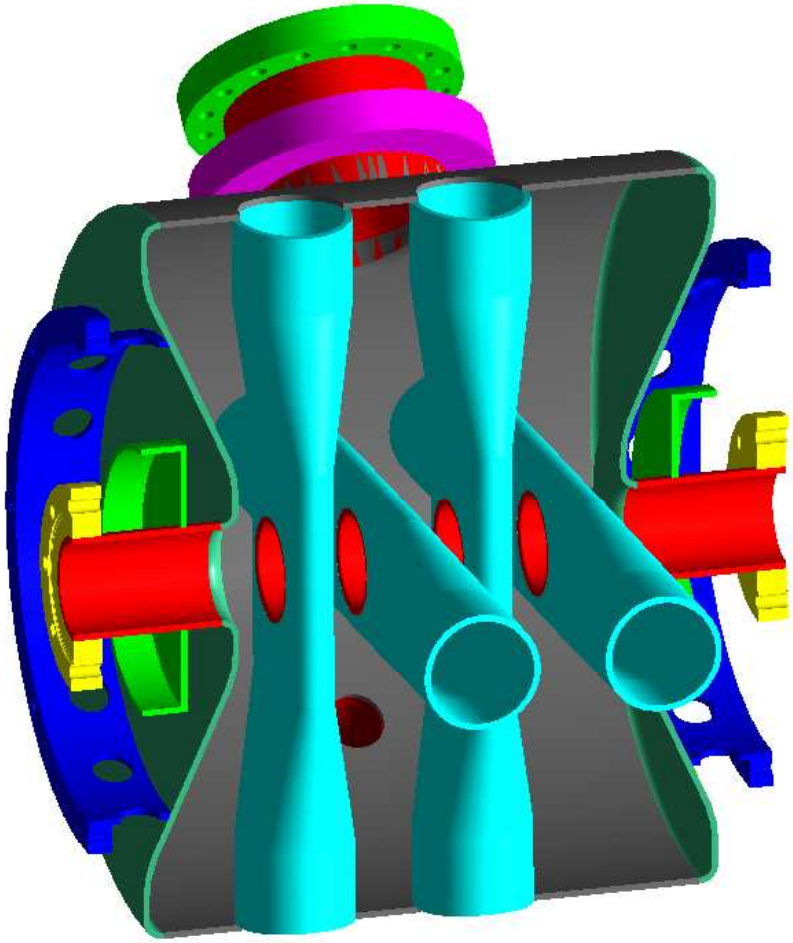


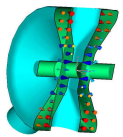
CEA/CNRS/DOE COLLABORATION

- **ELLIPTICAL CAVITIES:**
  - **DESIGN/PROCURE/TEST β = 0.5, 5-CELL, 704.4 MHz CAVITIES (2ea)**
- **SPOKE CAVITIES:**
  - **CONTINUE TESTS OF EXISTING CAVITIES:**
    - **LANL: β = 0.175, 2-GAP, 350 MHz CAVITIES (2ea)**
    - **CNRS: β = 0.34, 2-GAP, 352.2 MHz CAVITY**
  - **DESIGN/ β = 0.125, 5-CELL, 350 MHz CAVITIES (2ea)**
  - **PROCURE/TEST β = 0.125, 5-CELL, 350 MHz CAVITIES (2ea) in FY2004 & FY2005**



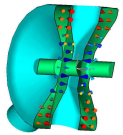
β = 0.125, 5-GAP, 350 MHz CAVITY





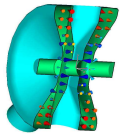
DESIGN/BID
POWER COUPLER

- **FABRICATE IN INDUSTRY**
- **BID IN June 2003, AWARD IN October 2004**
- **OPTIMIZED FOR ATW REQUIREMENTS**
- **PRELIMINARY REQUIREMENTS**
  - **20 mAmps**
  - **β = 0.175 (2-Gaps) - β = 0.34 (3-Gaps)**
  - **E_{acc} = TBD (~ 8 Mvolt/meter)**
  - **Power ~ 30 Kwatts**



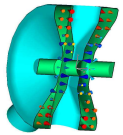
DESIGN/SPECIFY ELECTROPOLISHING FACILITY

- OBJECTIVE IS TO IMPROVE PERFORMANCE OF ELLIPTICAL CAVITIES
- DESIGN & SPECIFY IN FY2003
- PROCURE & INSTALL IN FY2004
- OPERATE IN FY2005



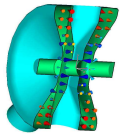
ATW STUDY

- **PERFORM LIMITED SCOPE TRADE STUDY TO CONSIDER SPOKE CAVITIES @ $\beta \sim 0.6$**
  - **Collaboration with RIA Project**



NIOBIUM STUDY w/JLAB & UVA

- **3-YEAR PROGRAM IN COLLABORATION WITH JLAB & UVA TO IMPROVE THE PROPERTIES OF NIOBIUM**
- **EMPHASIS ON IMPROVING THE MANUFACTURING PROCESSES TO IMPROVE BATCH-TO-BATCH CONSISTENCY**



6-YEAR PLAN

TASK	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Lab Operations	• Level of Effort	• Level of Effort	• Level of Effort	• Level of Effort	• Level of Effort	• Level of Effort
DOE/CEA/CNRS Collaboration	• Final Lab Tests of β=.175 Spoke Cavity • Des/Bid β=.125 Spoke Cavity • Des/Bid Power Coupler for β=.125 Spoke Cavity • Des/Bid β=.47 Elliptical Cavity	• Procure β=.125 Spoke Cavities • Procure Power Coupler for β=.125 Spoke Cavities • Procure β=.47 Elliptical Cavities • Design β=.60 Elliptical Cavity	• Lab Test of β=.125 Spoke Cavities • Lab Test of Power Coupler for β=.125 Spoke Cavities • Lab Test of β=.47 Elliptical Cavities • Procure β=.60 Elliptical Cavities • Concept of Cryostat for β=.175 Spoke Cavities	• Lab Test of β=.60 Elliptical Cavities • Concept of Cryostat for β=.125 Spoke Cavities • Concept of Cryostat for β=.47 Elliptical Cavities	• Concept of Cryostat for β=.60 Elliptical Cavities • Des/Proc Cold Test of Power Coupler for β=.125 Spoke Cavities	• Cold Test of Power Coupler for β=.125 Spoke Cavities
Power Couplers	• Des/Bid Power Coupler for β=.175 Spoke Cavity	• Procure Power Coupler for β=.175 Spoke Cavities	• Lab Test of Power Coupler for β=.175 Spoke Cavities	• Des/Bid Power Coupler for β=.60 Elliptical Cavities	• Des/Proc Cold Test of Power Coupler for β=.175 Spoke Cavities • Proc Power Coupler for β=.60 Elliptical Cavities	• Cold Test of Power Coupler for β=.175 Spoke Cavities • Lab Test of Power Coupler for β=.60 Elliptical Cavities
Lab Improvements	• Study Epolish System	• Proc/Install Epolish System	• Test Epolish System with APT Cavities • Des/Specify Heat Treat System	• Proc/Install Heat Treat System	• Test Heat Treat System with APT Cavities	•
ADS Optimization	• Study β=.60 Spoke Cavity	• Des RF-focussed Spoke Cavity	• Beam Dynamics of ADS Linac • Proc RF-focussed Spoke Cavity	• ADS System Concept • Lab Test of RF-focussed Spoke Cavity • Lab Test of High Gradient Spoke Cavities	• ADS System Concept • Lab Test of High Gradient Spoke Cavities • Lab Test of High-Gradient Elliptical Cavties	• ADS System Concept • Lab Test of High Gradient Spoke Cavities • Lab Test of High-Gradient Elliptical Cavties